

PATENT SPECIFICATION



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283,014

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COMPLETE SPECIFICATION.

Improvements in or relating to Drying Agricultural Produce.

(A communication from ARTHUR JOHN MASON, a citizen of the United States of America, of Homewood, Illinois, United States of America.)

I, HAROLD WADE, a British subject, of 111 & 112, Hatton Garden, London, E.C.1, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the treatment of agricultural crops, and is concerned with the drying, desiccating, or curing of freshly cut crops.

The invention comprises an improved process of and an improved drying oven for such treatment of said crops.

The particular type of drying oven which is improved by the present invention is that which comprises an elongated chamber, a perforate conveyor passing through said chamber and adapted to carry a crop mat therethrough and means to introduce a drying gas into said chamber.

According to the present invention an oven of the type above set forth is provided with means for passing the drying gas downwardly through the crop mat near the outlet end of the chamber where the mat is in a highly dried condition, then upwardly through the wet or moist crop mat at a point near the inlet end of the chamber, and means for permitting the said drying gas to escape from the said chamber after passing upwardly through the said crop mat at this point.

The process of drying a crop mat according to the invention consists in passing the crop mat through an elongated chamber whilst passing drying gas downwardly through said mat at its drier end and then upwardly through said mat at the undried end thereof.

Provision is made in the improved oven to effectively prevent the escape of the drying agent around the edges of the mat which would cause undue heating at such places. Provision is also made to evenly distribute the drying agent entering the oven in order to obtain great efficiency in the drying operation.

[Price 1/-]

The improved oven is also so constructed that the conveyor will move relatively freely and smoothly, without danger of disturbing the bond and texture of the mat resting thereon. Provision is also made at the ends of the oven to permit the mat to pass freely therethrough without the escape of the drying gases.

Novel means are also provided at the outlet end of the oven for breaking up the crop mat after the same has been dried.

Other features and advantages of the invention will appear more fully in the following description.

In that form of device embodying the features of the invention, shown in the accompanying drawings:

Figure 1 is a view in side elevation of the complete oven,

Figure 2 is a view in plan,

Figure 3 is a vertical sectional view of the oven showing the fan adapted to introduce the drying agent,

Figure 4 is a vertical sectional view of the outlet end of the oven,

Figure 5 is a view in plan of the outlet end with the top of the oven at such end removed,

Figure 6 is a part longitudinal sectional view of the oven,

Figure 7 is a plan view on an enlarged scale showing a part of the conveyor,

Fig. 8 is a vertical sectional view corresponding to Fig. 7, and Fig. 9 is a transverse vertical sectional view of the oven.

As shown in the drawings, the oven comprises in general a long tunnel-shaped chamber or casing 10 provided with an arched or vaulted roof. The chamber, for example, may be 150 feet long and preferably has a double wall, as indicated by 10^a, Fig. 9, made of any suitable material as, for example, sheet metal, an air space being left between the two walls for insulating purposes.

Arranged for travelling through the chamber 10 is a conveyor 11 adapted to carry the crop mat 12 from the inlet end of the chamber to the outlet end. The conveyor 11 comprises two chains 13, 13 one at each side of the chamber connected at intervals of say eight or nine inches by

angle iron slats 14, 14. At each end, the lower web or flange of the angle iron 14 is either folded up or removed as indicated by 14^a to permit fastening of the end of the slat to the chain 13 which is accomplished in the following manner. Every other link of the chain 13 is provided with an ear or lug 15 to which the end of the slat 14 is fastened in any suitable manner as, for example, by means of a rivet 16. The whole conveyor is covered with a wire netting 17, which may have, for example, a two inch mesh.

A short distance beyond the outlet end of the oven, the conveyor passes over a driving drum 18 which may be driven in any suitable manner as, for example, by a motor 19 driving the wheel 20 by means of the chain 21. The wheel 20, by suitable gearing through the intermediate gear 22 is adapted to drive the drum 18, which in turn is provided with sprockets on its ends to engage the chains 13 of the conveyor. A suitable idler wheel or drum (not shown) is provided a short distance beyond the inlet end of the oven for the purpose of supporting the other end of the conveyor.

The upper strand of the conveyor is carried on two angle iron tracks 23, 23, fastened to the inner walls of the oven. The chains 13, 13, rest upon these tracks 23. The lower flange of each of the angle irons 23 is five or six inches wide. These flanges form inwardly projecting guides which act as a seal to prevent the escape of hot gases around the edge of the mat 12. It is to be noted that the mattress substantially fills the entire width of the oven, thus overlapping the flange 23 to form such a seal. The mat, being formed is made the full width so that, as it enters the oven, the edges of the mat will rub against the sides of the oven. The vertical flange 23^a of each angle iron is also preferably made several inches high; and the mat, being made full width, upon settling down on the conveyor is squeezed slightly inwardly at the edges by such vertical flanges 23^a, thus assisting in making a tight joint and seal at the edges of the mat to prevent the escape of hot gases at such places. The return strand of the conveyor is carried in any suitable manner as, for example, on the idler drums 24, 24.

The oven itself is divided into two main compartments for the purpose of controlling the heated gases and causing them to pass through the travelling mat twice. The hot or outlet end of the oven receives the hot gases. The drying agent used may, for example, be hot gases received from a furnace (not shown) and introduced by a fan 31, and it has been found

that for leguminous plants a temperature of from 275° to 300° F. is desirable. The gases are introduced preferably at a pressure of about one inch of water, first passed downwardly through the travelling mat and thence upwardly through the mat at the inlet end of the oven where the crop is greener, and thence are vented to the atmosphere. The inlet to the oven, where the hot gases enter is indicated by 25. This inlet leads into the compartment 26 at the outlet end of the oven, which is separated from the compartment 27 at the inlet end by the partition 28. The partition 28 extends from the top of the oven to a line a short distance above the crop mat, a seal at this place being formed by means of the curved plate hinged at 29^a. The lower end of this curved plate 29 drags on the upper surface of the mat 12 to form a seal.

30 indicates the stack or vent from the compartment 27 to the atmosphere. The general direction of travel of the gases is indicated by the arrows in Fig. 6. It will be seen that the gases enter the inlet 25 thence pass downwardly through the mat, thence under the mat toward the inlet end of the oven, and thence again upwardly through the mat and out through stack or vent 30.

In the device shown, the crop mat may be approximately nine feet wide and from eight to ten inches thick, and may travel through the oven at the rate of about five feet per minute so that each part of the mat will be exposed to the drying medium for approximately thirty minutes in its travel through an oven 150 feet long.

Opposite the inlet 25 (see Fig. 3) is provided a by-pass or vent 32 which may be manually opened or closed. When open it permits the hot gases from the fan 31 to escape directly into the atmosphere without heating the mat. The vent 32, for example, may be used in the event of any stoppage of the travel of the mat in order to prevent overheating.

At the inlet end of the oven there is provided a curved plate 33 hinged at its upper edge, similar to the curved plate 29 to provide a seal at this end; and likewise at the outlet end of the oven above the mat is a similar seal formed by means of the curved plate 34. At this end of the oven is also provided a seal under the mat which may be formed of two elliptical plates 35, 35, hinged together at their outer edges. The inner edge of the upper plate is hingedly supported just below the top strand of the conveyor and the inner edge of the lower plate is adapted to rest on the last idler roller 24^a, which is a solid drum extending across the whole width of the oven.

It is to be particularly noted that the travel of the gases is in a direction generally counter to the direction of movement of the mat; and that the gases enter the oven above the mat. These features are of especial importance because the crop, as it progresses through the oven, becomes lighter, drier and more fragile. At and near the outlet end of the oven the crop is quite dry and crisp. For this reason, it is better to introduce the new drying gas at this end above the mat so that where the mat is especially dry and crisp, the drying gases will pass downwardly through it instead of upwardly. If the gases pass upwardly there would be more tendency to separate some particles from the mat and carry them away with the gases. In chamber 27, the gases pass upwardly through the mat but this, it is to be noted, is at the inlet end of the oven where the mat is relatively green and tenacious.

At the outlet end of the oven the mat issuing therefrom, preferably passes eight or ten feet beyond the end of the oven where it may be inspected from time to time and where the conveyor itself may be repaired as may be necessary. At this point, the mat usually has a certain amount of bond, so that it is desirable to break it up into smaller pieces suitable for grinding. There is provided at this end a series of fingers or bars 36 about eight inches apart, for example, three quarters of an inch thick, the ends of which rest on the mat. These fingers or bars 36 are ranged across the entire width of the mat and are independent of each other so that they rest upon the crop and hold it sufficiently for the disintegrating device to do its work.

Below the ends of the fingers 36 is arranged the disintegrating device comprising a revolving shaft 37 provided with spikes 38. This shaft revolves at a speed of from seventy to eighty rotations a minute so that the end of the mat falling upon it is broken up into smaller pieces, which in turn fall upon the cross conveyor 39 adapted to carry the same to any suitable grinding device. The spikes 38 are set 90° apart, and each is preferably about eight inches long, the spikes in each row being preferably four or five inches apart.

While certain embodiments of the invention have been described, it is to be understood that variations may be made in the construction and arrangement without departing from the scope of the invention as set forth in the appended claims.

Having now particularly described and ascertained the nature of the said inven-

tion and in what manner the same is to be performed, as communicated to me by my foreign correspondent, I declare that what I claim is:—

1. A drying oven of the character described comprising; an elongated chamber; a perforate conveyor passing through said chamber and adapted to carry a crop mat therethrough; means for introducing a drying gas into said chamber; means for passing the drying gas first downwardly through the crop mat near the outlet end of the chamber where the mat is in a highly dried condition, then upwardly through the wet or moist crop mat at a point near the inlet end of the chamber, and means for permitting said drying gas to escape from said chamber after passing upwardly through said crop mat, at this point.

2. A drying oven as claimed in the preceding claim, in which the space on one side of the mat is divided into two compartments and means are provided for introducing drying gas into one of said compartments, and venting the same from the other, said compartments and oven being provided with means for directing the whole of the flow of drying gas from one compartment or chamber to another solely through said mat.

3. A drying oven as claimed in either of the preceding claims, in which means are provided for causing the drying gas to pass through the mat, thence for a substantial distance along the chamber in a direction counter to the direction of movement of the mat and then again through the mat.

4. A drying oven as claimed in any of the preceding claims provided with means for disintegrating the dried crop mat upon issuing from the oven.

5. A drying oven as claimed in Claim 4, in which the disintegrating means comprises a rapidly rotating member carrying radially arranged spikes adapted to engage the crop mat.

6. A drying oven as claimed in Claim 5, in which the disintegrating means is combined with hinged fingers arranged above the crop mat and adapted to bear down upon the same and hold it in engagement with said spikes.

7. A drying oven as claimed in any of the preceding claims characterised in that walls or partitions extending close to the crop mat, are provided with flexible means bearing upon said mat for the purpose of ensuring the passage of the drying gas therethrough.

8. A drying oven as claimed in any of the preceding claims, in which the conveyor passing therethrough comprises two chains at the sides thereof connected by

spaced slats carrying thereon a wire netting.

9. A drying oven as claimed in Claim 8 in which said chains rest on angle irons at the sides of the oven.

10. A drying oven as claimed in any of the preceding claims, in which there are provided inwardly projecting guides at the sides of the oven to overlap the edges of the conveyor and support the same to form a seal between the walls of the oven and the edges of a crop mat carried by the conveyor.

11. The process of drying a crop mat consisting in passing the crop mat through an elongated heating chamber and during its passage, passing a drying

gas firstly downwardly through said mat at the drier end of the crop mat and then upwardly through said mat at the undried end thereof.

12. The process of drying a crop mat as claimed in Claim 11, in which the drying gas is moved in a direction generally counter to the direction of movement of the crop mat.

13. The improved drying oven and process of drying the crop mat substantially as described and as illustrated by the accompanying drawings.

Dated this 9th day of March, 1927.

BOULT, WADE & TENNANT,
111/112, Hatton Garden, London, E.C. 1,
Chartered Patent Agents.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

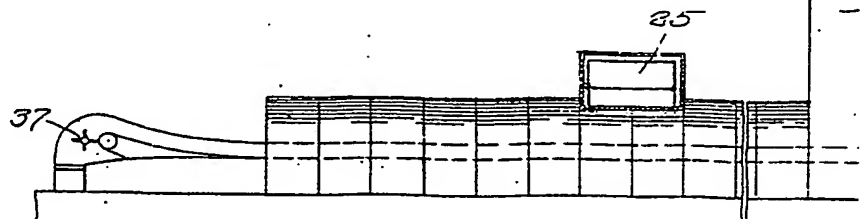


Fig. 2.

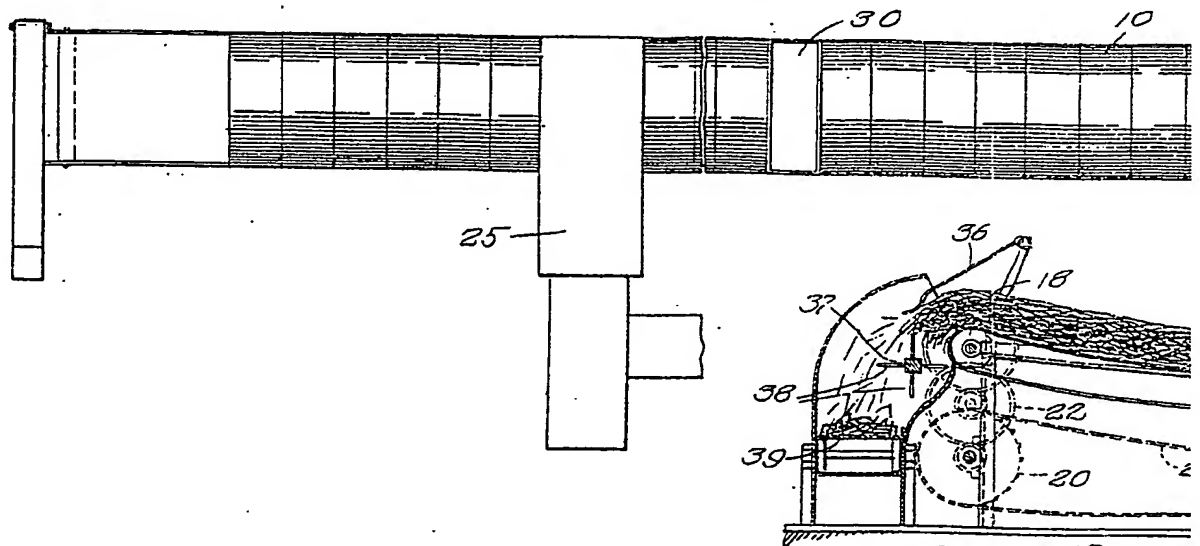


Fig. 3.

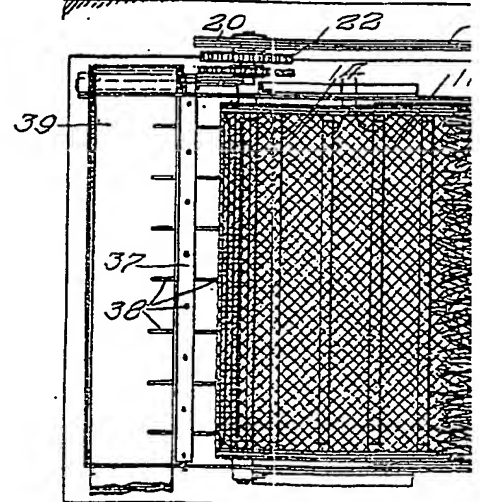
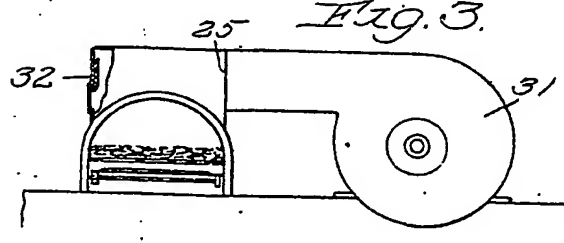


Fig. 1.

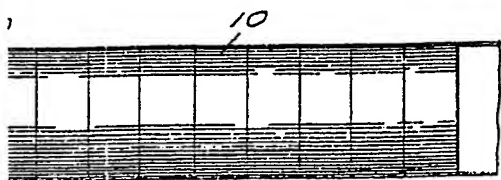
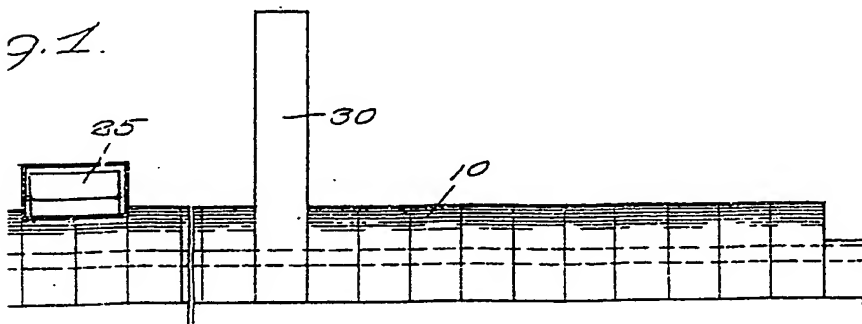
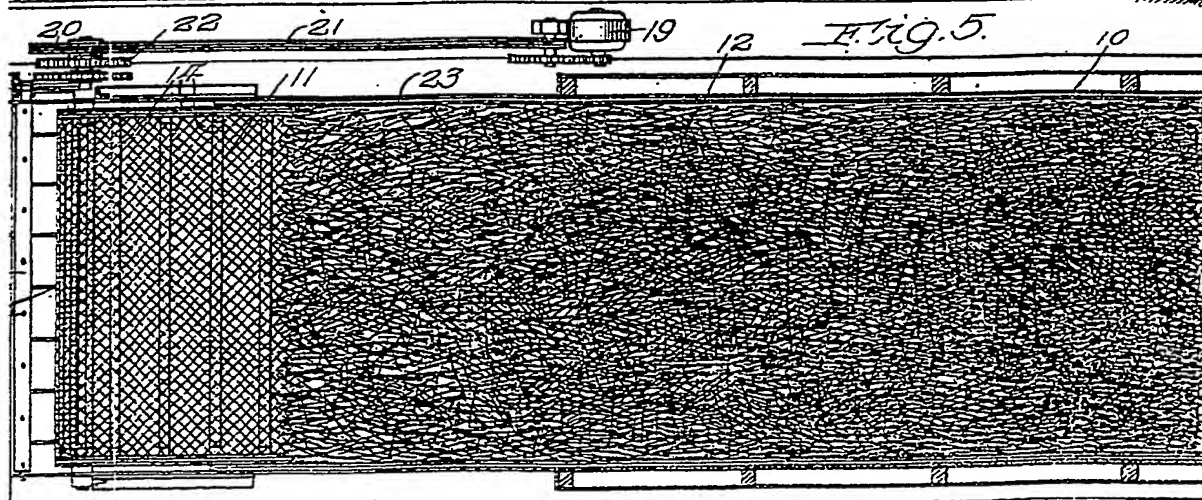
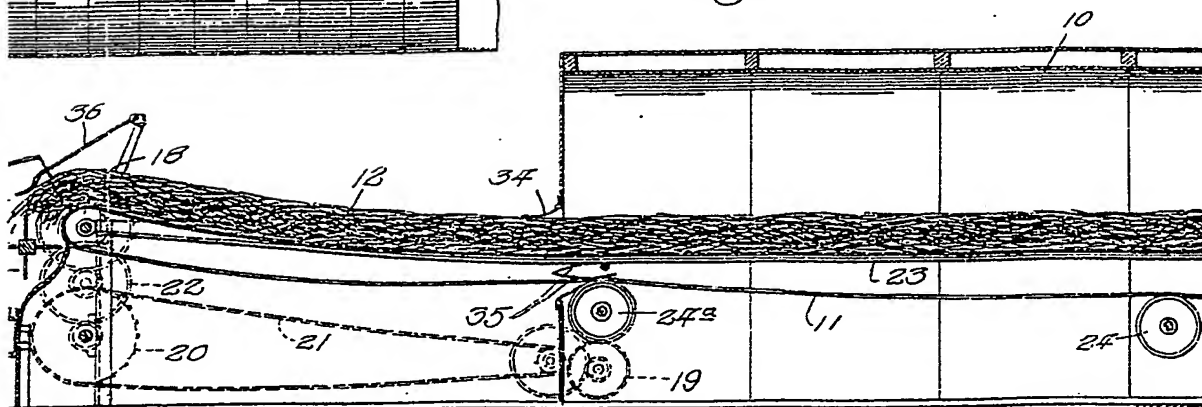


Fig. 4



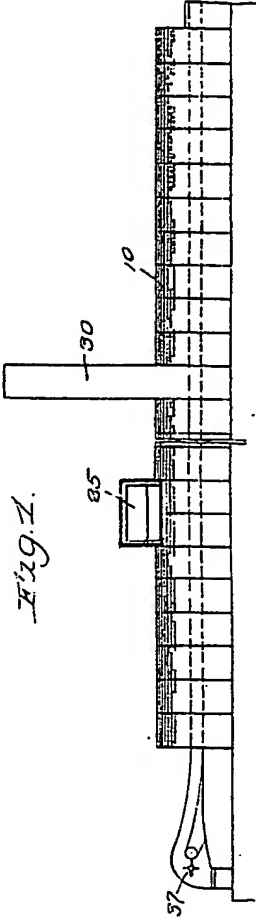


Fig. 2.

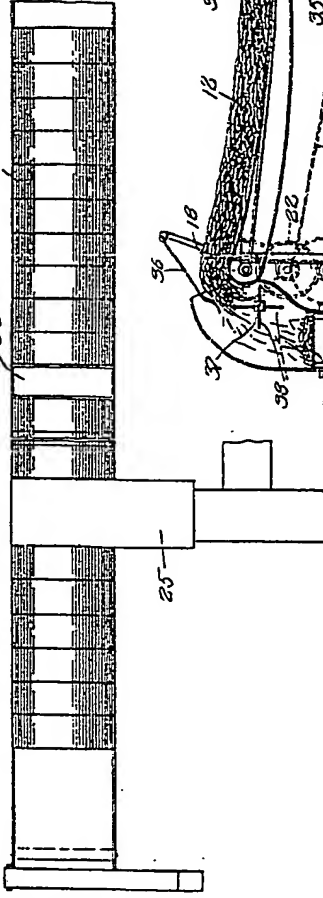


Fig. 4.

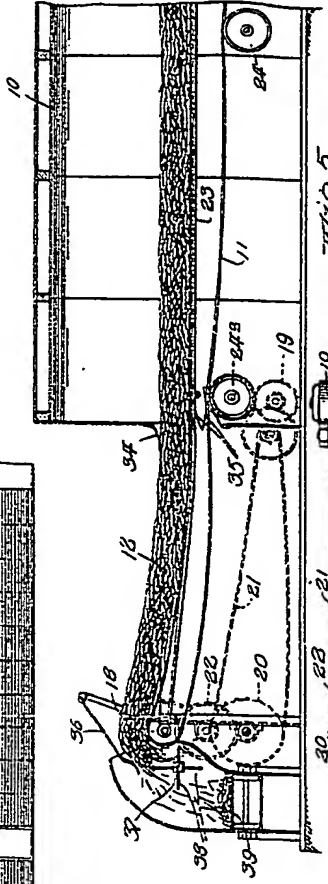


Fig. 5.

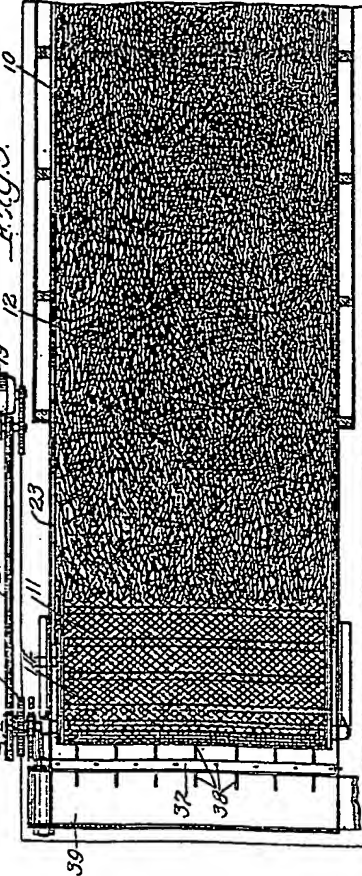
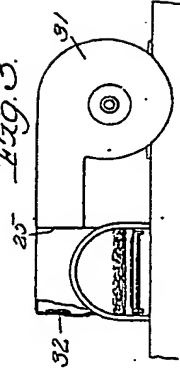


Fig. 3.



[This Drawing is a reproduction of the Original on a reduced scale]

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Fig. 6.

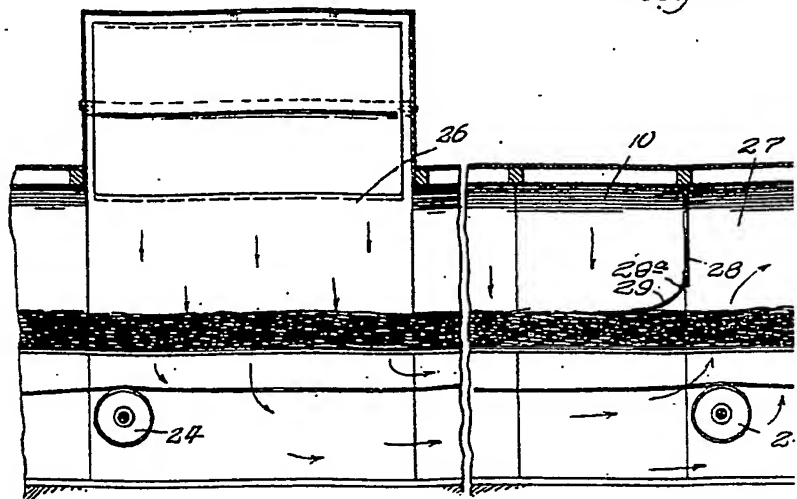


Fig. 7.

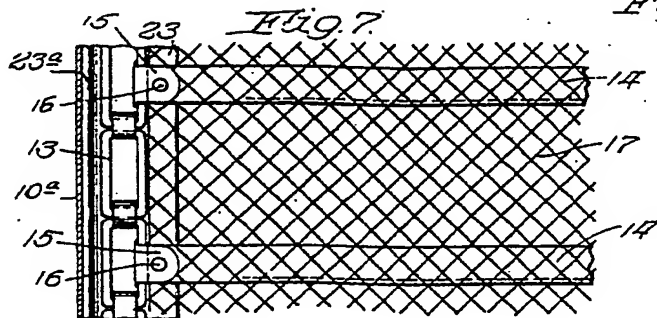


Fig. 8.

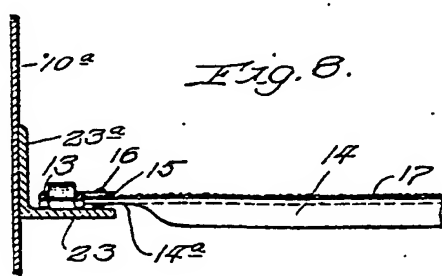


Fig. 9.

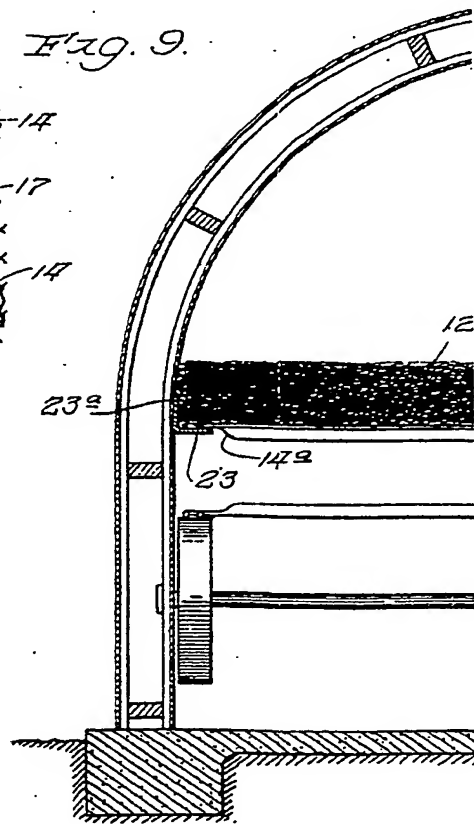
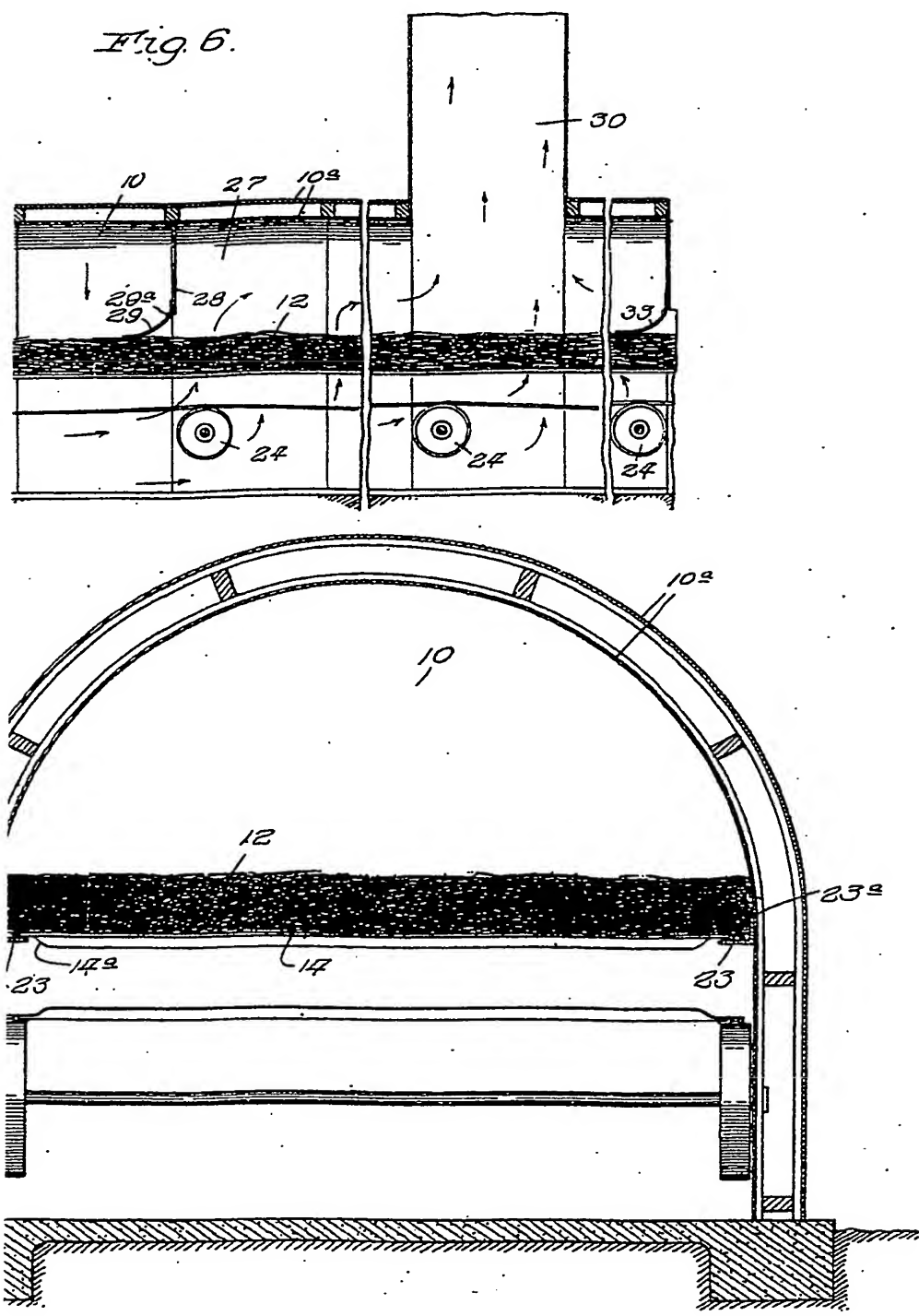


Fig. 6.



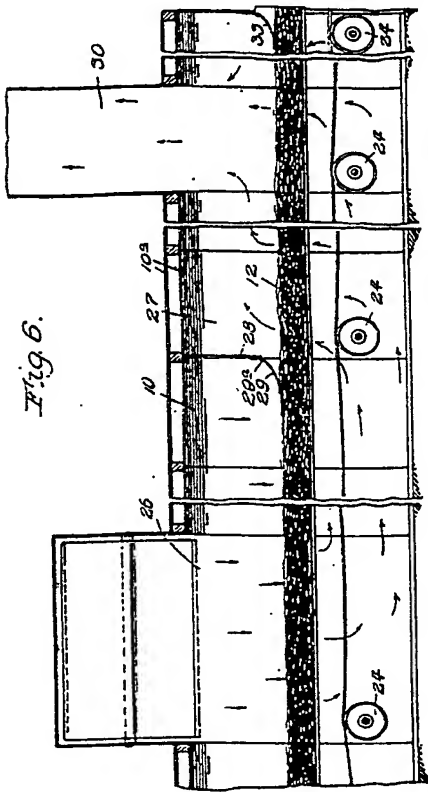


Fig. 6.

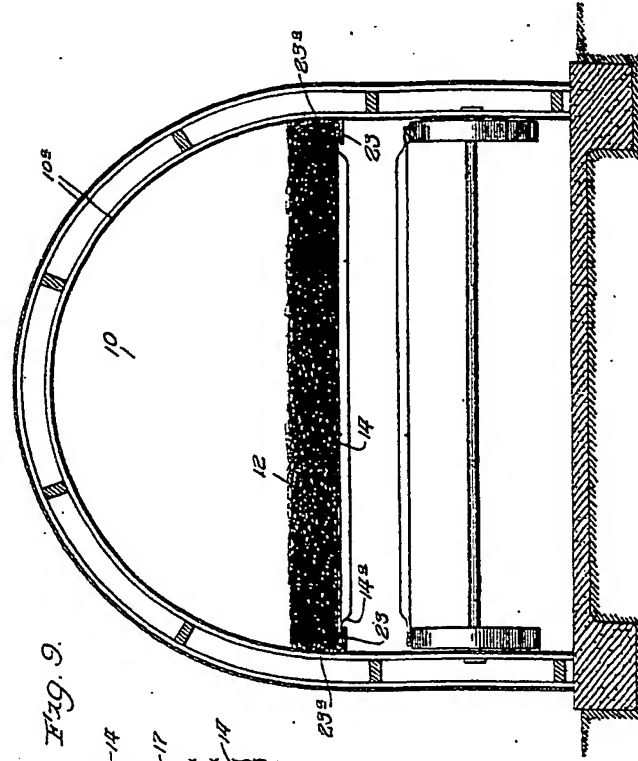


Fig. 9.

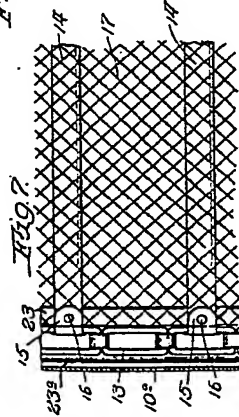


Fig. 7.

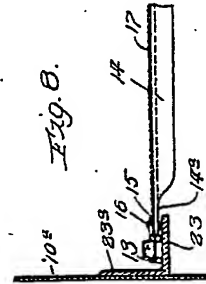


Fig. 8.

[This Drawing is a reproduction of the Original on a reduced scale.]